



Woodfuel grapple in the biomass heating plant in the Vauban area in Fribourg, Germany

BADENOV AG & CO KG



**+6.7%**

*the growth of electricity from solid biomass in the UE between 2014 and 2015*

# SOLID BIOMASS BAROMETER

*A study carried out by EurObserv'ER.*



**S**olid biomass consumption, primarily wood energy, is still largely governed by heating requirements which are climate-dependent. The main factor for the European rebound in solid biomass consumption as primary energy during the winter of 2015 is that it was not as mild across the continent as the previous winter. Leaving aside climatic variations, the use of solid biomass for producing heat or electricity has tended to increase in the European Union, spurred on by European support policies. A new consumption record of 93.8 Mtoe was posted in 2015... a rise of 3.8 Mtoe over 2014.

**93.8 Mtoe**

*Gross inland consumption from solid biomass in the EU in 2015*

**89.5 Mtoe**

*Primary energy production from solid biomass in the EU in 2015*





Biomass heating plant in Cenon, Gironde, France

**S**olid biomass includes all the solid organic components to be used as fuels... wood, wood waste (wood chips, sawdust, etc.), wood pellets, black liquors from the paper industry, straw, bagasse, animal waste and other materials and solid plant residues. Energy recovery from solid biomass results in the production of heat and electricity. Lignocellulosic biomass (cereal straw, forestry waste, etc.) can also be converted into 2nd generation biofuel or first converted into gas, such as hydrogen or methane, but is not covered by this barometer. The main energy recovery technique used for solid biomass is combustion in a boiler, which results in producing hot water or steam for industrial processes, district heating networks or to heat collective or service buildings. The steam can also be sent to a turbine to produce electricity or to a cogeneration plant (CHP) that combines electricity and heat production. A large proportion of solid biomass is used directly by households and other end users (firms) in wood-fired heating appliances such as boilers, inserts or stoves.

**SOLID BIOMASS CONSUMPTION PICKS UP IN EUROPE IN 2015**

Solid biomass is far and away the main source of renewable energy used in Europe and the rest of the world. In the European Union of 28, it accounted

for about half of all renewable energy consumption, namely 93.8 Mtoe (table 1) out of a total slightly over 200 Mtoe in 2015 (201.2 Mtoe according to Eurostat in 2014). During the first decade of the millennium, solid biomass consumption in the EU of 28 increased constantly. However since the 2010s, growth in solid biomass consumption as primary energy has faltered through several years with atypical climatic conditions. The winters of 2011 and 2014 were extremely mild, with the result that heating needs and subsequently household wood consumption contracted. Nonetheless, the general trend over time is for solid biomass consumption to increase, be it for heat production or for electricity production. Although 2015 is one of the warmest years on record, it was not as mild across the European Union as it was in 2014 (with local exceptions such as Finland). It stands to reason that solid biomass energy consumption picked up (by 4.2% in comparison with 2014) and reached 93.8 Mtoe in 2015, breaking its previous consumption record in 2013 (91.6 Mtoe)(graph 1). Solid biomass primary energy production, whose solid biomass is sourced from European Union soil, is rising at a slightly slower pace (3.8%) and achieved 89.5 Mtoe (table 1). The difference, made up of nett imports, has tended to increase over the past few years from 2.3 Mtoe in 2012 to 4.3 Mtoe in 2015. It can

primarily be put down to higher wood pellet imports from North America (see further on). In tables 2, 3 and 4 EurObserv'ER separates the uses of final energy sourced from solid biomass, namely electricity and heat. Solid biomass heat is in turn differentiated by direct use in final consumers' heating appliances (boilers, burners, inserts, etc.), which accounts for most of the consumption or conversion and distribution via heating networks (heat sales). According to EurObserv'ER, consumption of heat directly used by final consumers rose by 5% over 2014 (3.1 Mtoe) to 64.9 Mtoe in 2015. Gross solid biomass heat output sold on to heating networks heat rose by 3.2% (0.3 Mtoe) to meet increased heating demands. It rose to 9.3 Mtoe in 2015 and 62.5% of this figure was produced by CHP plants, i.e. that produce heat and electricity at the same time. If we add these two elements together, total final biomass heat energy consumption increased by 4.8% to 74.2 Mtoe. European Union solid biomass electricity production is less sensitive to climate variations, and is governed more by the policies of a few Member States to develop biomass electricity, either by converting old coal-fired plants or by developing biomass cogeneration. However, the new European biomass electricity policy revealed in the "clean energy" package should impede conversions of coal-fired plants into biomass

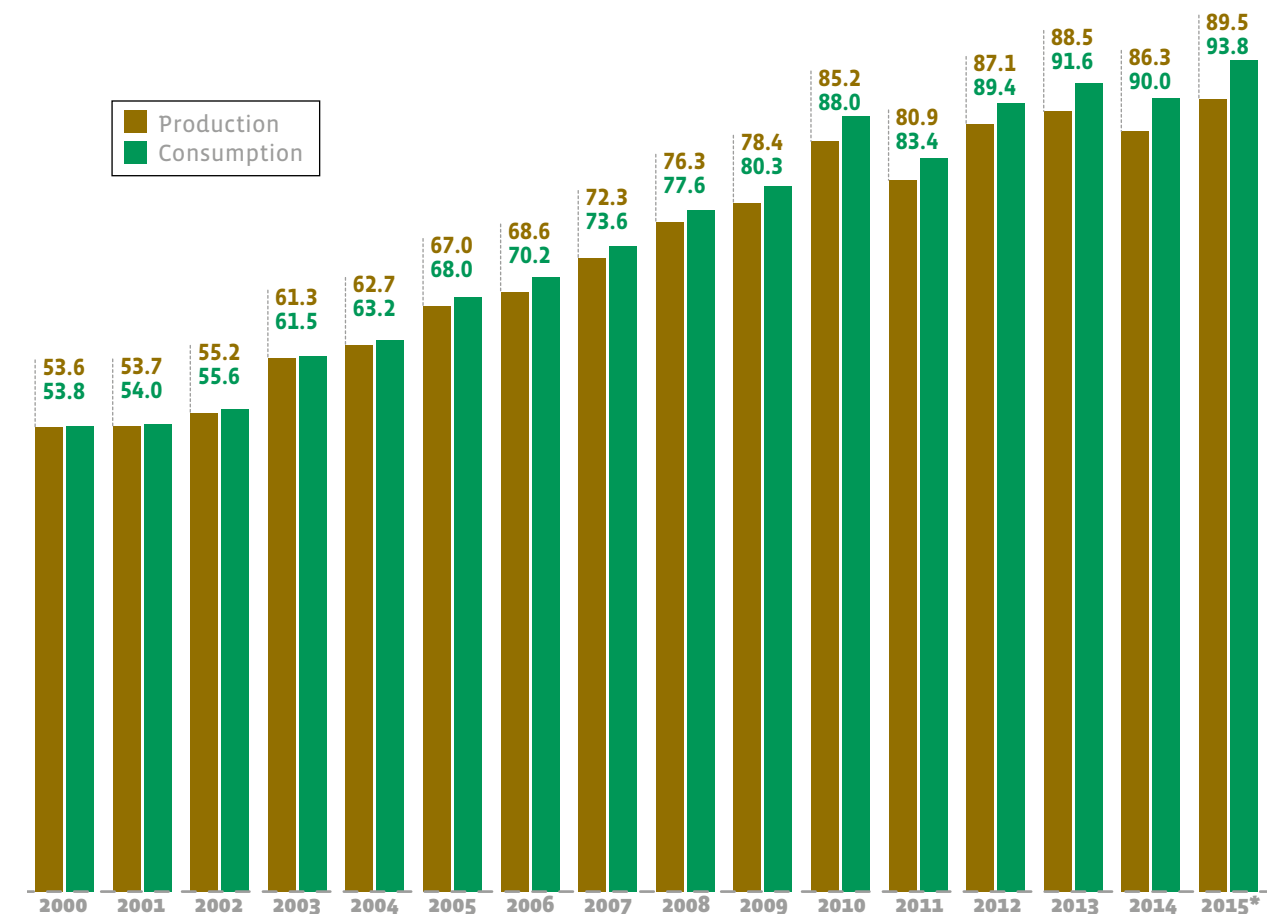
plants that do not operate as CHPs (see last section) after 2020. Cogeneration has become the main vector of solid biomass production growth. At European Union level, biomass electricity output increased by 6.7% (5.7 TWh) over 2014 to 90.4 TWh in 2015. However, we should note that for the past three years the UK has been the main driving force increasing European Union solid biomass electricity output. Its output rose by 5.6 TWh between 2014 and 2015 and by 9.6 TWh between 2013 and 2015. Growth in the other countries in 2015 has been more patchy with rises in Belgium (0.9 TWh between 2014 and 2015) and France (0.5 TWh), contrasted by drops in Germany (0.8 TWh), Finland (0.4 TWh), Denmark (0.2 TWh) and the Netherlands (0.2 TWh).

**EU WOOD PELLET CONSUMPTION IS THRIVING**

Data released by the EPC (European Pellet Club) in the AEBIOM's latest annual statistical report 2016 European Bioenergy Outlook, shows that pellet consumption rose significantly in 2015. In the European Union of 28, consumption increased by 7.8% between 2014 and 2015 to 20.3 million tonnes. European Union pellet production stood at 14.1 million tonnes (4.7% more than in 2014), therefore imports (from the USA and Canada in particular) served just over 30% of EU wood pellet demand. The same source claims that

**Graph. n° 1**

Solid biomass primary energy production and inland consumption growth figures for the EU since 2000 (in Mtoe)



\*Estimate. Sources: years 2000-2013 Eurostat, years 2014 and 2015 EurObserv'ER.



63.9% of pellet consumption in 2015 was used for heating purposes, broken down as 8.5 million tonnes for home heating, 3.2 million tonnes for “commercial” heating and 1.2 million tonnes in CHP plants. The remaining 36.1% was channelled into electricity production split between 6.7 million tonnes in power plants and 0.6 million tonnes in CHP plants.

Despite a fairly mild winter and low oil prices, the EPC reckons that pellet consumption for heating increased by 4.2% between 2014 and 2015 to reach 12.9 million tonnes. Italy is the leading consumer (with 3.1 million tonnes), followed by Germany (2.3 MT), Denmark (1.8 MT), Sweden (1.6 MT) and France (1 MT). Incidentally wood pellet uses vary by country. In Italy, Germany and France, at 92%, 58% and 95% respectively, most of the consumption is devoted to the home heating market, while 56% of Denmark’s consumption goes for heat production in CHP plants, and in Sweden 60% is earmarked for boiler plants (commercial heating), yet only 8% for producing heat in CHP plants.

The increase in pellet consumption for electricity production in the EU of 28 (14.9% between 2014 and 2015) was even higher, reaching 7.3 million tonnes. The main consumers were the UK with 5.7 million tonnes (a 21.4% rise), Belgium with 1 million tonnes (a 67% rise) and Denmark with 0.5 million tonnes (a 0% rise). Swedish consumption dropped by 25.7% to only 70 000 tonnes

#### NEWS FROM AROUND SOME OF THE PRODUCER COUNTRIES

#### BREXIT WILL HAVE A SIGNIFICANT IMPACT ON EUROPE’S BIOENERGY LANDSCAPE

The UK’s exit from the European Union will shake up the solid biomass energy scene. While the UK only accounts for 6.5% (6.1 Mtoe in 2015) of the total solid biomass consumption of the EU of 28, it has led Europe in solid biomass electricity production since 2014. The Department for Business, Energy & Industrial Strategy claims that solid biomass electricity output rose from 13 852 GWh in 2014 to 19 418 GWh in 2015, which equates to 40.2% growth. The UK now produces 21.5% of the European Union’s solid bio-

mass electricity. If the UK is taken out of the equation, then overall European Union solid biomass electricity output has been stable since 2013 and has even contracted slightly (71.1 TWh in 2013, 70.8 TWh in 2014 and 70.9 TWh in 2015). British policy supporting biomass and more generally renewable electricity should be stepped up over the next few years. On 9 November 2016, the UK government pre-

sented its plan to phase out coal by 2025 as a side event to the Marrakech Climate Conference. While the plan counts on using gas and nuclear power, it also plans to invest £ 730 million annually in aid for renewable electricity projects over the next fifteen years (offshore wind power, advanced conversion technologies, anaer-

**Tabl. n° 1**

*Primary energy production and gross inland consumption of solid biomass in the European Union in 2014 and 2015\* (in Mtoe)*

Country	2014		2015*	
	Production	Consumption	Production	Consumption
Germany	11.417	11.417	12.062	12.062
France**	9.074	9.074	9.559	9.559
Sweden	8.923	8.923	9.129	9.129
Italy	6.539	8.066	6.712	8.357
Finland	8.117	8.137	7.901	7.927
Poland	6.179	6.755	6.268	6.774
United Kingdom	3.165	4.885	3.824	6.097
Spain	5.161	5.276	5.260	5.260
Austria	4.227	4.361	4.473	4.573
Romania	3.646	3.618	3.700	3.620
Czech Republic	2.842	2.763	2.954	2.874
Denmark	1.308	2.351	1.590	2.532
Portugal	2.671	2.351	2.603	2.340
Belgium	1.104	1.689	1.166	1.937
Hungary	1.403	1.390	1.414	1.457
Latvia	2.047	1.337	2.008	1.257
Lithuania	1.117	1.084	1.205	1.204
Croatia	1.375	1.093	1.470	1.200
Netherlands	1.290	1.147	1.364	1.179
Greece	0.869	0.930	0.952	1.013
Bulgaria	1.087	0.992	1.100	1.000
Estonia	1.122	0.789	1.209	0.825
Slovakia	0.759	0.752	0.734	0.734
Slovenia	0.533	0.533	0.590	0.590
Ireland	0.210	0.252	0.201	0.228
Luxembourg	0.060	0.059	0.050	0.059
Cyprus	0.009	0.012	0.010	0.012
Malta	0.001	0.001	0.001	0.001
European Union	86.254	90.036	89.511	93.800

\* Estimate. \*\*Overseas departments not included for France. Source: EurObserv’ER 2016.



Biomass heating plant in Igelsta, Sweden

**Tabl. n° 2**

*Gross electricity production from solid biomass in the European Union in 2014 and 2015\* (in TWh)*

Country	2014			2015		
	Electricity only plants	CHP Plants	Total electricity	Electricity only plants	CHP Plants	Total electricity
United Kingdom	13.852	0.000	13.852	19.418	0.000	19.418
Germany	5.300	6.500	11.800	4.800	6.200	11.000
Finland	1.073	9.894	10.967	1.217	9.372	10.588
Poland	0.000	9.161	9.161	0.000	9.027	9.027
Sweden	0.000	9.007	9.007	0.000	8.977	8.977
Spain	2.856	0.965	3.821	3.126	0.888	4.014
Italy	2.011	1.739	3.750	2.077	1.786	3.862
Belgium	1.388	1.244	2.632	2.298	1.256	3.554
Austria	1.109	2.332	3.440	1.232	2.264	3.497
Denmark	0.000	2.959	2.959	0.000	2.803	2.803
Portugal	0.765	1.765	2.530	0.795	1.723	2.518
France**	0.095	1.543	1.637	0.098	2.042	2.140
Czech Republic	0.054	1.938	1.992	0.049	2.042	2.091
Netherlands	1.436	0.662	2.099	1.724	0.173	1.897
Hungary	1.537	0.165	1.702	1.540	0.173	1.713
Slovakia	0.011	0.905	0.916	0.011	0.842	0.853
Estonia	0.061	0.670	0.731	0.069	0.641	0.710
Romania	0.237	0.217	0.454	0.237	0.217	0.454
Latvia	0.002	0.317	0.319	0.000	0.378	0.378
Lithuania	0.000	0.293	0.293	0.000	0.318	0.318
Ireland	0.251	0.014	0.265	0.184	0.013	0.197
Bulgaria	0.010	0.128	0.138	0.010	0.128	0.138
Slovenia	0.000	0.125	0.125	0.000	0.131	0.131
Croatia	0.000	0.050	0.050	0.000	0.050	0.050
Luxembourg	0.000	0.021	0.021	0.000	0.024	0.024
Greece	0.000	0.000	0.000	0.002	0.000	0.002
European Union	32.047	52.612	84.659	38.886	51.467	90.353

\* Estimate. \*\*Overseas departments not included for France. Source: EurObserv’ER 2016.





robic digestion, biomass cogeneration, marine energies and geothermal power). The UK government also gave the details of the next Contracts for Difference (CfD) auction for a total sum of £ 290 million. This second round of CfD auctions should produce enough electricity for 1 million people and reduce carbon emissions by approximately 2.5 million tonnes from 2021/2022 onwards, according to the government. The Strike Price for biomass cogeneration has been set at £ 115/MWh for projects that should start producing electricity from 2021–2022 or 2022–2023 onwards. Consultations on the coal phase-out plan are underway until 1st February 2017.

#### WOOD CONSUMPTION IN FRANCE IS ON A SLIGHT UPSWING

France had its third hottest year since 1900 in 2015 following 2011 and 2014 – which had a marked impact on solid biomass consumption for heating. Accord-

ing to the French Sustainable Development Ministerial Statistical Department (SOeS), consumption in mainland France reached 9.6 Mtoe in 2015 compared to 9.1 Mtoe in 2014, but remained below its 2013 level of 10.4 Mtoe. Heat accounts for about 95% of the energy produced by this sector, while the remaining 5% produces electricity. Wood-energy accounts for almost all of this production, of which 73% is devoted to heating family dwellings. While 2015 was one of the hottest years in the last three decades, it was a little cooler than the previous year on average, which explains the rebound of the wood-energy sector despite the drop in wood heating appliance sales (see the Observ'ER study, [www.energies-renouvelables.org](http://www.energies-renouvelables.org)).

Leaving aside domestic heating, ADEME and the French Environment Ministry continue to promote biomass heat through the Heat Fund via BCIAT (Biomass Heating for Industry, Agriculture

and Services) calls for projects. In 2016, 10 new winners were designated, which takes the number of projects benefiting from this support mechanism to 120 since 2009. At the end of 2016, 66 facilities were already in service, producing more than 330 ktoe and all the winning projects from 2009–2016 will produce 680 ktoe, so avoiding 2.1 million tonnes of CO<sub>2</sub> emissions. The Environment Minister also designated the 19 winners of the Dynamic wood call for Expressions of Interest (Eoi) in 2016 which aims to accelerate the use of wood in boiler plants. These projects will result in the use of a further 1 million tonnes of wood per annum.

An important landmark for French regions taking charge of their biomass potential will be for them to individually adopt regional biomass schemes, before 18 February 2017, in line with the energy transition law's provisions. These plans should match the multi-annual energy programming (PPE) aims, approved by

Decree No. 2016-1442 of 27 October 2016. The PPE provides for 540 MW of installed solid biomass electricity capacity by 31 December 2018 and capacity ranging from 790 MW (low option) to 1 040 MW (high option) by 31 December 2023. France's renewable heat and cooling production development aims for biomass (excluding biogas) are 12 Mtoe by 31 December 2018 and output ranging from 13 Mtoe (low option) to 14 Mtoe (high option) by 31 December 2023. In particular the regional biomass scheme must determine "the orientations and actions to be implemented at regional and infra-regional level to stimulate the

biomass production and recovery sectors likely to be put to energy use, taking care that the multi-functionality of natural areas is upheld, primarily farming and forest areas".

#### GERMANY'S WOOD CONSUMPTION BOOSTED BY FALLING TEMPERATURES

Data released by AGEEstat indicates that solid biomass consumption passed the 12 Mtoe mark, with a 5.6% increase over 2014. There are two reasons for this increase – firstly the harsher weather which boosted heating requirements and secondly the larger base of modern

wood-burning heating appliances. Renewable energy use in Germany's heating sector is regulated by the renewable heat law (EEWärmeG) which came into force on 1 July 2009. It intends to raise the renewable energy share of final energy consumption for heating and cooling to 14% by 2020. Thus the law has made partial use of renewable heat compulsory in all new buildings, and in existing public buildings. Owners are free to choose the type of renewable energy they wish to use, but if they choose a system that runs on solid biomass, it must cover at least

### Tabl. n° 3

Gross heat production from solid biomass in the European Union in 2014 and in 2015\* (in Mtoe) in the transformation sector\*\*

Country	2014			2015		
	Heat plants only	CHP plants	Total Heat	Heat plants only	CHP plants	Total Heat
Sweden	0.716	1.562	2.278	0.704	1.614	2.318
Finland	0.630	1.055	1.685	0.594	1.012	1.606
Denmark	0.398	0.592	0.990	0.420	0.602	1.022
Austria	0.457	0.333	0.790	0.471	0.356	0.827
France***	0.256	0.359	0.616	0.326	0.395	0.721
Germany	0.179	0.358	0.537	0.184	0.399	0.583
Italy	0.065	0.528	0.593	0.062	0.502	0.564
Lithuania	0.261	0.095	0.355	0.346	0.100	0.445
Poland	0.033	0.300	0.333	0.029	0.268	0.297
Estonia	0.049	0.133	0.182	0.075	0.140	0.215
Latvia	0.095	0.090	0.185	0.095	0.106	0.201
Czech Republic	0.022	0.117	0.139	0.030	0.123	0.153
Slovakia	0.041	0.073	0.113	0.040	0.071	0.111
Hungary	0.042	0.035	0.077	0.052	0.036	0.088
Romania	0.029	0.035	0.064	0.029	0.035	0.064
Netherlands	0.009	0.017	0.025	0.018	0.014	0.032
Slovenia	0.006	0.014	0.019	0.008	0.018	0.027
Luxembourg	0.003	0.008	0.011	0.004	0.009	0.013
Bulgaria	0.004	0.003	0.007	0.004	0.003	0.007
Belgium	0.000	0.007	0.007	0.000	0.006	0.006
Croatia	0.000	0.006	0.006	0.000	0.006	0.006
United Kingdom	0.003	0.000	0.003	0.004	0.000	0.004
European Union	3.298	5.719	9.018	3.494	5.817	9.311

\* Estimate. \*\* Heat sold in district heating. Decimals are written with a comma. \*\*\* Overseas departments not included for France. Source: EurObserv'ER 2016.

50% of the building's heating consumption. The Federal Government encourages the use of heating appliances running on renewable energy through the "Marktanreizprogramm" (MAP) market incentive programme in addition to the EEWärmeG law. From 2000–2015, the MAP programme funded 383 000 domestic biomass heating appliances (mainly pellet

burners) to the tune of 701 million euros of aid. In 2015 alone, 32 500 new pellet burners were installed. The Federal Ministry for Economic Affairs and Energy's (BMWi) annual "Renewable Energy in Figures" report for 2015 states that renewable energy-sourced heat consumption grew faster than overall heat consumption by putting on 8.5%

growth to 158 billion kWh. The renewable energy share of total energy consumption for heating and cooling rose from 12.5% in 2014 to 13.2% in 2015.

#### NEW TEMPERATURE RECORDS CURB FINLAND'S WOOD CONSUMPTION

In Finland, solid biomass-sourced energy

consumption dropped again according to Statistics Finland, from 8.1 Mtoe in 2014 to 7.9 Mtoe in 2015. The explanation for this drop is another warm year that reduced heating requirements. It had a direct impact on solid biomass consumption as the country is the leading gross per capita consumer of solid biomass energy consumption (graph 2).

The Finnish Meteorological Institute points out that the country went through four exceptionally warm years in the first half of the decade... 2011, 2013 and 2014 crowned by a record year in 2015, when home heating consumption dropped by 5% to 41 TWh (3.5 Mtoe). The most popular heat sources in Finland used for heating are electricity, heating networks and wood-fired appliances. It should be noted that the use of solid biomass is widespread for generating electricity (10.6 TWh) and supplying district heating networks (1.6 Mtoe). The good news is that wood energy consumption level was kept up in the manufacturing sector as wood is the main energy source used – it commands a 37% share of the 12 Mtoe total (i.e. 4.4 Mtoe).

#### A MULTI-FACETED INDUSTRY

There is no biomass industry as such, but rather a broad variety of market segments. The European biomass scene for energy is multi-faceted, including manufacturers, service providers, producers and component suppliers for the various forms of energetic biomass conversion in the residential, commercial, industrial heating, electricity or transport sectors. The segments are ranging from the direct wood production in the forestry industry, transportation and logistics, pellet production, over the industrial wood fuel conversion, i.e. the planning, construction and operation of biomass plants, for electricity and heat production, the operation of district heating plants and networks, the component supply to these utilities (biomass boilers) or the manufacturing of individual heating appliances. Important players in the European biomass industry are largely located in the markets with the highest shares of biomass in terms of installed generating capacity. According to the 2016 IRENA solid biofuels capacity statistics, over 23 300 MW of generating capacity

were installed in the European Union, with Sweden (4 340 MW) and Germany (3 962 MW) heading the table, and with Italy (1 446 MW), Austria (1 332 MW), Denmark (1 172 MW), and France (908 MW) in the follow-up positions. Most notably the Scandinavian EU member states Sweden and Finland have well-established forestry sectors, Denmark has implemented ambitious district heating

projects, Austria has a vibrant scene of technology suppliers, Germany, in its current strive to efficiently connect the different markets segments of power, heat and transport fuels (a process termed sector coupling), or the United Kingdom that increasingly modernizes its (coal) power plant infrastructure with increa-

Tabl. n° 4

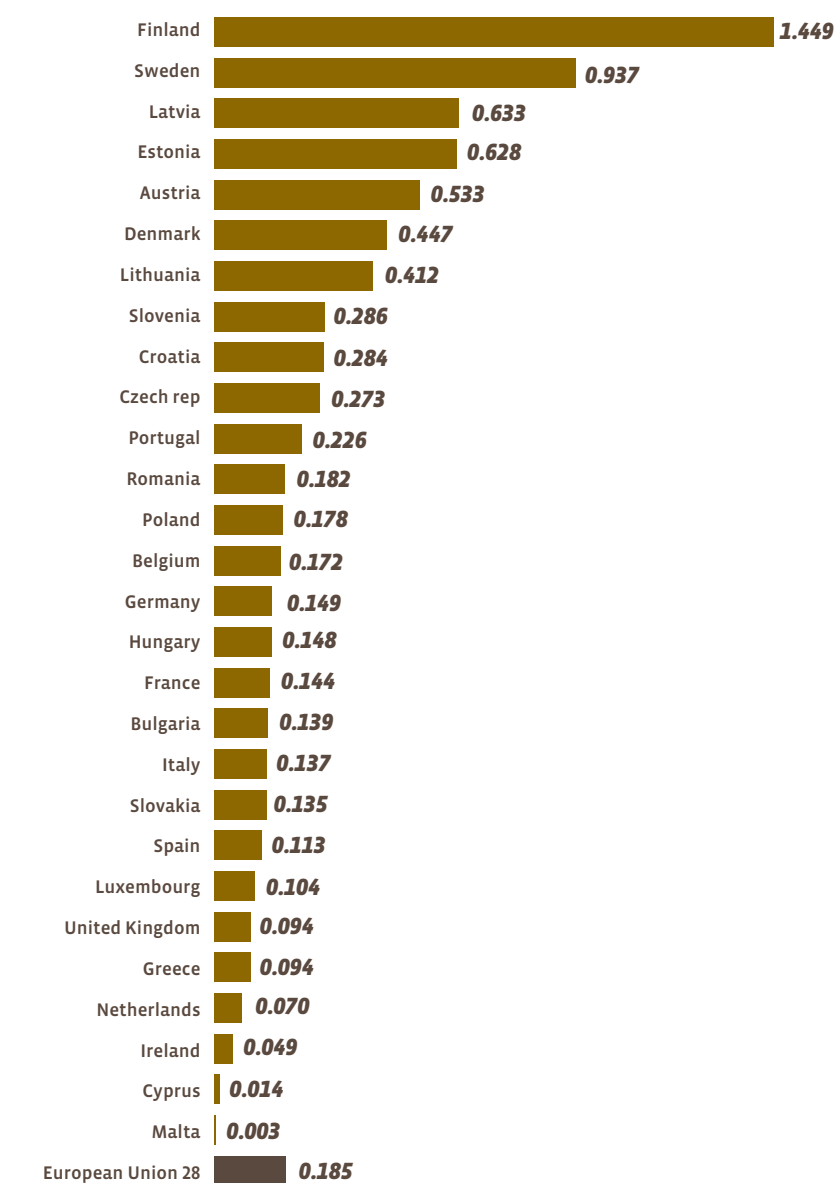
Heat consumption\* from solid biomass in the countries of the European Union in 2014 and 2015\*\*

Country	2014	Of which direct use by end user	Of which district heating	2015	Of which direct use by end user	Of which district heating
Germany	8.372	7.834	0.537	9.253	8.670	0.583
France***	8.314	7.698	0.616	8.836	8.115	0.721
Sweden	7.464	5.186	2.278	7.689	5.371	2.318
Italy	6.594	6.001	0.593	6.856	6.292	0.564
Finland	6.530	4.846	1.685	6.433	4.826	1.606
Poland	4.771	4.438	0.333	4.786	4.489	0.297
Spain	3.734	3.734	0.000	3.926	3.926	0.000
Austria	3.580	2.790	0.790	3.728	2.902	0.827
Romania	3.495	3.431	0.064	3.564	3.500	0.064
United Kingdom	2.197	2.193	0.003	2.595	2.591	0.004
Czech Republic	2.335	2.196	0.139	2.404	2.251	0.153
Denmark	1.949	0.958	0.990	2.171	1.149	1.022
Portugal	1.742	1.742	0.000	1.720	1.720	0.000
Belgium	1.135	1.128	0.007	1.186	1.181	0.006
Croatia	1.058	1.052	0.006	1.106	1.100	0.006
Latvia	1.194	1.009	0.185	1.106	0.905	0.201
Lithuania	0.990	0.635	0.355	1.065	0.620	0.445
Hungary	0.916	0.839	0.077	1.064	0.976	0.088
Greece	0.927	0.927	0.000	1.010	1.010	0.000
Bulgaria	0.959	0.952	0.007	1.007	1.000	0.007
Estonia	0.654	0.472	0.182	0.692	0.477	0.215
Netherlands	0.645	0.620	0.025	0.685	0.653	0.032
Slovenia	0.510	0.491	0.019	0.565	0.538	0.027
Slovakia	0.481	0.367	0.113	0.478	0.367	0.111
Ireland	0.196	0.196	0.000	0.193	0.193	0.000
Luxembourg	0.054	0.043	0.011	0.053	0.040	0.013
Cyprus	0.011	0.011	0.000	0.011	0.011	0.000
Malta	0.001	0.001	0.000	0.001	0.001	0.000
European Union 28	70.806	61.789	9.018	74.184	64.874	9.311

\* Consumption of the end user (either as heat sold by the district heating or self-consumed, either as fuels for the production of heat and cold). \*\* Estimate.  
\*\*\*Overseas departments not included for France. Source: EurObserv'ER 2016.

Graph. 2

Gross energy consumption of solid biomass in toe per inhab in the European Union in 2015\*







Stevens Croft's biomass heating plant in Lockerbie, Scotland

sing shares of solid biomass in co-firing CHP plants.

The trend observed last year of converting coal-fired plants to 100% biomass plants continued. The UK, Denmark and Finland are specifically active in this scene, despite some biomass subsidy cuts in 2015 in the UK. In the DRAX power plant – once Britain's biggest coal station, biomass provided about 70 percent of fuel to in the first half of 2016, up from 37 percent in the same period in 2015. Drax announced that it has upgraded a third unit to run on wood pellets and plans for further conversions. To illustrate the sheer amount of biomass electricity, we need to keep in mind that biomass based electricity generated in the

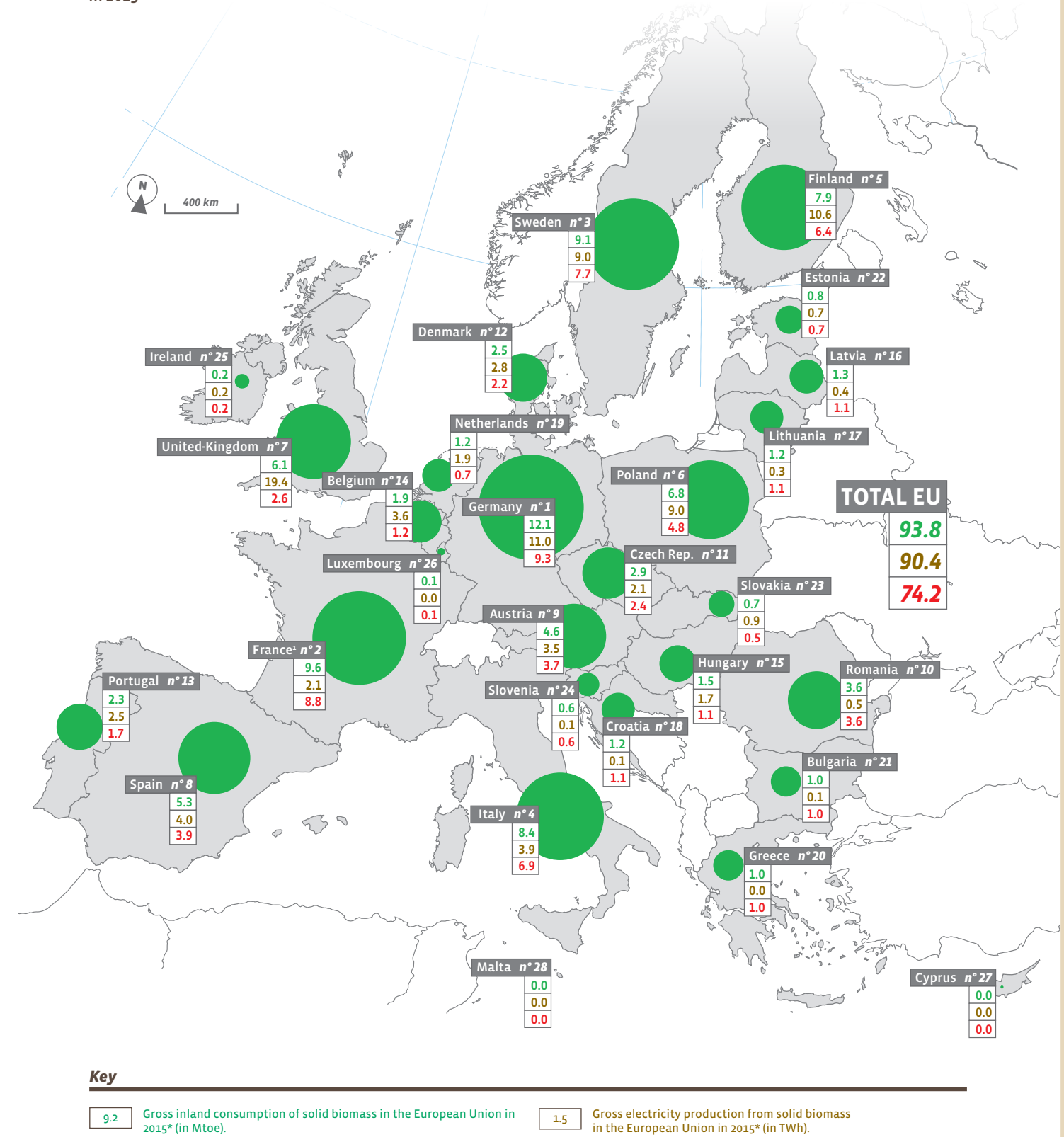
plant, represents about 20 percent of renewable and 8 percent of Britain's total power. Further illustrations in Scandinavia and Eastern Europe could be named. Finnish Valmet and Danish HOFOR Energiproduktion A/S announced to install a 500 MW biomass CHP plant in Copenhagen. The signed €150 million contract to replace an existing 600-MW coal-fired plant with a biomass CHP plant by 2019 aims at emission reductions of some 1.2 million tons annually which would turn the plant into the tenth largest in the world. In Denmark, the utility Dong Energy in October 2016 finally switched its Studstrup combined heat and power (CHP) plant in Aarhus from coal to wood pellets. The boilers use electricity to pro-

vide district heating when the Danish wind turbines are running at full capacity and the electricity prices are low. Another example can be found in Latvia where one of the largest dairy processing companies inaugurated a new 8 MW biomass-fuelled steam boiler unit. The new biomass plant will produce about 51 200 MWh of energy annually, displacing the equivalent of 6.4 million Nm3 of fossil gas thus avoiding around 10 500 tons of CO<sub>2</sub> emissions.

And in Finland Pori Energia has announced that its ageing Aittaluoto CHP plant will undergo a EUR 50 million investment for boiler replacement and a flue gas treatment overhaul by 2020. This measure shall increase the share of biomass fuels used as well as increase the overall fuel efficiency of the plant. The plant with a combined thermal input of 206 MW and 55 MW electric output also exemplifies another important trend often overlooked as crucial pillar of energy transitions: the increasingly beneficial role of biomass in renewable heat supply. The plant supplies district heat to the Pori and Ulvila district heating networks as well as process steam to the industrial park. The plant uses a mix of fuels including woody biomass and peat. Fortum Värme's Värtaverket CHP plant in the Swedish capital Stockholm has one of Europe's largest district heating and cooling systems, which has entered its final testing phase. The new Värtaverket biomass-fired CHP plant is connected to Stockholm's southern-central district heating network. Fortum Värme supplies the city of Stockholm with heat and electricity and cooling – a concept termed tri-generation. The new plant uses forest biomass as fuel, increasing the overall use of biomass at Värtanverket from around 45 percent to as high as 70 percent according to the Bioenergy International magazine. And in Latvia, Axis Technologies, has won the bid to build the countries' largest biomass energy project. Awarded by energy utility Rigas BioEnergija the EUR 30 million contract is for a 48 MW capacity biomass-fired district heating plant. The project consists of two identical boiler plants in Riga, each unit consisting of a 20 MW biomass boiler with a 4 MW flue gas condensing economizer.



**Gross inland consumption, gross electricity production and heat consumption from solid biomass in the European Union in 2015\***



\* Estimate. † Overseas departments not included. Source: Eurobserv'er 2016.

**PELLET SECTOR**

According to a report by the UN Food and Agriculture Organization (FAO) global wood pellet production surged to record levels in 2014. The main production centers are located in Europe (61% of production) and North America (33% in USA and Canada). The top five consumers of pellets were U.K., U.S., Denmark, Italy and Sweden, with a total consumption amounting to 14 million metric tons or 55 percent of global consumption. At the beginning of 2016 the insolvency of Germany's largest Pellet producer (German Pellets) made headlines. Although this insolvency has no real impacts on the supply and consumption side for consumers, and the reason for breakdown are rather unprofessional business practices, it is a reminder that the transformation of the energy systems are no self-evident one way roads. The German pellet market is also witnessing lower prices according to information from DEPV the German pellet association. Pellets are cost competitive with oil and gas. 1 kWh of heat from pellet costs around 4,79 cents/kWh compared to 6,45 cents/kWh from gas or 4,39 cents/kWh from oil. Despite improved support conditions, the pellet market declined by 10% in 2015. The sales of pellet boilers and wood stoves also declined in 2015. Nevertheless, large projects based on pellet combustion started operation in 2016. In Finland, energy utility Helen

Oy contracted Valmet to supply a EUR 20 million wood pellet fired heating plant to its Salmisaari power plant in Helsinki with a district heating capacity of 92 MW. At full capacity it will use 21 tons of wood pellets per hour. A major challenge ahead of the biomass industry is certainly the low price range of fossil oil and gas which are currently not favoring investments in biomass based solutions. Also the low carbon certificate prices are dis-incentivizing further progress. France has announced to introduce a gradually increase carbon tax on fossil fuels, which might in turn unleash a massive stimulus and investment programme in renewables and energy efficiency from which companies active in the French heat and electricity markets might clearly take advantage. Current issues and topics debated in the European biomass industry relate to the supply of residues and by-products from agriculture and forestry or the production of short rotation woody biomass. Biomass strategies, policies and targets for 2030 may also take into consideration bioenergy's positive contribution to the creation of low carbon economies. Ways ahead for the bioenergy sector seem to be the combination of bioenergy with other renewable energy sources, biomass energy storage, and the integration of biomass systems in more flexible supply systems. Due to its very nature, biomass could play a vital role in grid

balancing, an ever more present issue in EU countries with increasing shares of RES in the electricity mix.

**2030 – THE “WINTER PACKAGE” IS BLOWING HOT AND COLD**

The year 2015 is a suitable occasion to see how the land lies as far as targets are concerned and compare them with the National Renewable Energy Action Plan (NREAP) trajectories. As far as heat consumption is concerned, the European Union taken together is ahead of its planned trajectory with 77.6 Mtoe (including 3.4 Mtoe from the incineration of renewable urban waste) compared to the projection of 66.2 Mtoe in 2015 (Graph 3). The reason for this significant difference can be put down to the efforts made by Member States to develop solid biomass heat but almost certainly to initial underestimation of their consumption of this type of heat. We note that since the NREAPs were published in 2010, a few countries such as Germany, Spain, Italy, the UK and France, followed recently by the Czech Republic have upgraded their biomass heat consumption estimates retroactively, primarily as a result of more accurate surveys of household wood energy consumption.

Despite these statistical shots in the arm, current momentum is not as positive as it was during the first decade of the millennium, and the climate is partly to blame for this. Since 2010, biomass heat consumption has come up against a run of abnormally warm years that has reduced heating requirements. Points in case are 2014 and 2015 while 2016 looks as though it will also be very hot. Another reason that gives more to celebrate than climate warming, is that some of the wood-fired heating appliance base has been replaced by high energy efficiency systems that use very much less wood. This trend, which seems set to last, has prompted EurObserv'ER to downward revise its projections of biomass heat consumption, although, given the state of progress, the common NREAP goal should be exceeded.

As regards electricity production, the high growth of solid biomass electricity output of 111.2 TWh (including 20.9 TWh

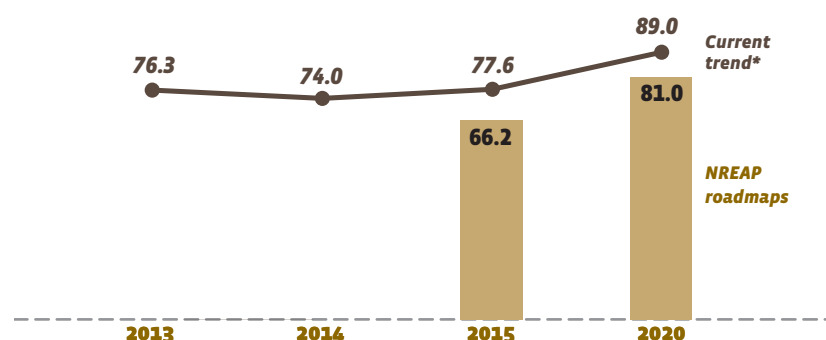
sourced from renewable urban waste) in 2015 has made up for much of the delay in reaching the common NREAP target of 113.8 TWh in 2015 (graph 4). However the downside of this achievement is that most of the increase in solid biomass electricity production is the result of the UK's policy to convert coal-fired power plants. On the contrary, solid biomass electricity output in the other major producing countries has tended to fall. In relation to 2013, output is lower in the Nordic countries (Finland, Sweden and Denmark), and also in the Netherlands, Germany, Austria and Spain. If the UK is left out, and it is due to leave the European Union, solid biomass electricity production's momentum is mediocre. France, Belgium, Spain, the Netherlands and Poland are clearly drifting further away from their NREAP roadmaps. We can hint at the lack of political determination, the low price of the tonne of coal and the per tonne price of carbon being too low to play its role of stimulating renewable electricity as just some of the reasons. Furthermore, in some countries the construction or conversion of high-capacity biomass plants that do not operate as CHP plants (such as the Gardanne plant in France), has also courted controversy about the sustainability of large quantities of biomass fuel supplies and the fact that

their yields are lower than CHP plants. Incidentally these remarks have been factored in by the European Commission in its new draft renewable energy directive for plants built after 2020 (see further on). On 30 November 2016, just three years before the 2020 deadline, the European Commission presented its new Clean Energy Package of measures that aims to round off the European Union climate and energy framework to the 2030 timeline. The package includes a number of amendment proposals to directives covering energy efficiency, renewable energy, the design of the electricity market, security of electricity supply and governance rules for the Energy Union. It is a legislative arsenal aimed at shaping Europe's forthcoming energy system. As for the package aims, it covers broadly the same lines as the terms of the agreements set by the European Council in October 2014. To recap, the European Union set itself the aim of collectively reaching a 27% share of renewables in final energy consumption by 2030 and reducing its GHG emissions by 40%. The only difference is in the energy consumption reduction target. The Commission proposes to take the target to 30% instead of 27% and make it binding. As for heating and cooling, the Commission recalls that “three out of four Euro-

pean homes are heated with fossil fuels. This corresponds to 68% of the EU's gas import, and is a sign of slow growth of clean energy in a sector which takes half of EU's energy needs. In order to address these challenges, the Renewables Directive includes a number of options for Member States to increase their share of renewable energy in heating and cooling supply, by 1 percentage point per year until 2030.” The new directive's proposal “opens access rights to local district heating and cooling systems for producers of renewables heating and cooling and waste from industry and third parties acting on their behalf”. Despite the European Commission's declared enthusiasm, the “clean energy” package received a cold reception from the European associations that promote renewable heat (and cooling) (AEBIOM, EGEC, EHPA, ESTIF), who criticise its unambitious renewable energy targets and over-generous attitude towards fossil fuels. As currently worded, the energy efficiency directive does not actually specify which energy sources and technologies are eligible for achieving the energy efficiency targets. This omission allows Member States to finance the most efficient heating technologies using fossil fuels such as condensing gas and oil-fired boilers. These policies are curbing the development and sales of high-efficiency renewable energy-sourced heating systems, and primarily heating appliances that use wood or wood pellets. The winter package also introduces major changes to the energy use of solid biomass. The revised renewable energy directive strengthens current European Union criteria that apply to bioenergy sustainability and extends their application to biomass and biogas used to produce heat and electricity. One of the new sustainability criteria in the proposed measures now applies to the forest biomass used for energy purposes, to mitigate the risk of forest overexploitation and guarantee that accounting rules on land use, land use change and forestry (LULUCF) are applied. The sustainability criteria will be extended to large heat-producing and biomass or biogas electricity producing installations (with capacities of >20 MW) combined with a

**Graph. n° 3**

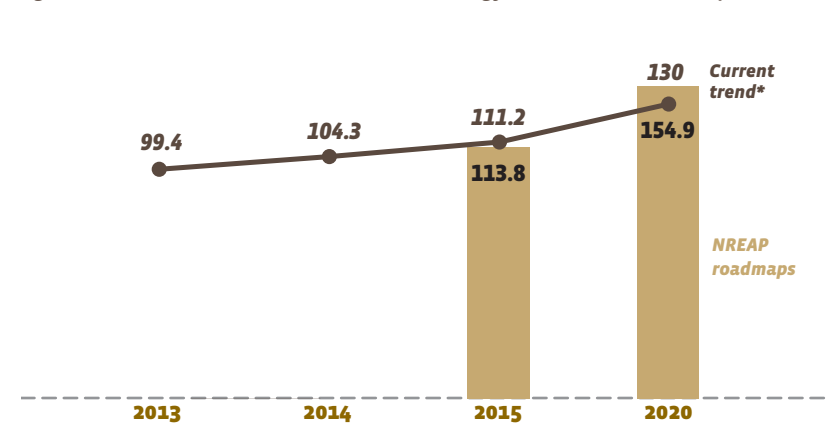
Comparison of the current trend of heat consumption from solid biomass against the NREAP (National Renewable Energy Action Plan) roadmaps (in Mtoe)



These data include an estimate of the renewable heat from incineration plants of municipal waste. Source: EurObserv'ER 2016.

**Graph. n° 4**

Comparison of the current trend of electricity production from solid biomass against the NREAP (National Renewable Energy Action Plan) roadmaps (in TWh)



These data include an estimate of the renewable electricity from waste incineration units. Source: EurObserv'ER 2016.





binding reduction in GHG of 80% compared to fossil fuels from 2021 onwards and of 85% from 2026 onwards). This is compounded by the demand that the electricity is produced by high-efficiency cogeneration (with a yield of >80%). However there will be no challenge to the acquired rights of existing installations.

According to AEBIOM, which reacted in a press release, the European Commission has taken a pragmatic approach that takes into account some of the realities on the ground, such as not proposing special sustainability requirements for very big installations and endorsing a risk-based approach for forest biomass, primarily on the supply sources of very large plants. The association considers that the European Commission has also opted for a rational approach founded

on land-based sustainability by biomass type (biomass from forestry, biomass from agriculture, etc.) as opposed to by energy consumption. AEBIOM's President, Didzis Palejs reacted by saying « *As wood can be used to make biofuels or produce heat and electricity, the Commission's approach addressing sustainability of forest biomass, whatever its energy end use, makes sense.* »

However, AEBIOM regrets that this approach has not been followed for defining a single GHG emissions target for all bioenergy. It is also concerned that by giving Member States the flexibility they need to define additional sustainability rules, the Commission's proposal cannot ensure that the whole sector is handled evenly. « *I am very concerned that a lack of full harmonisation at EU level could*

*hamper biomass trade and lead to unequal treatment among economic operators,* » said Eric Vial, President of the European Pellet Council.

As regards the production of solid biomass electricity, AEBIOM notes the Commission's political rationale to only include electricity produced by efficient cogeneration technology in target accounting. However the approach ignores the potential role that could be played by "biopower" in backing up variable renewable electricity such as wind and solar. The association fears that this provision could leave the door wide open for fossil fuel development, which runs counter to the EU's decarbonisation targets and commitments. □

*The next barometer will cover wind power*

**Sources :** Statistics Austria, SPF Economie (Belgium), Ministry of Industry and Trade (Czech Republic), ENS (Denmark), Statistics Estonia, Statistics Finland, SOeS (France), ZSW AGEE-Stat (Germany), CRES (Greece), SEAI (Ireland Republic), Statistics Netherlands, Statistics Lithuania, STATEC (Luxembourg), CSB (Latvia), GUS (Poland), DGGE (Portugal), IDAE (Spain), Statistics Sweden, DBEIS (United Kingdom), Statistical Office RS (Slovenia), GUS (Poland), IEA, Observ'ER.



*This barometer was prepared by Observ'ER in the scope of the "EurObserv'ER" project with the collaboration of RENAC (DE). Sole responsibility for the publication's content lies with its authors. It does not represent the opinion of Ademe nor that of Caisse des dépôts. Ademe and Caisse des dépôts may not be held responsible for any use that may be made of the information published. This action benefits from the financial support of Ademe and Caisse des dépôts.*